LWG
LOWER WILLAMETTE GROUP

Memorandum

To: Eric Blischke and Chip Humphrey, EPA Region 10

From: Lower Willamette Group

CC:

Date: December 17, 2009

Re: Response to EPA's comments dated November 24, 2009 on the QEA Fate Model

This memo provides a response to EPA's comments in a letter dated November 24, 2009, on the QEA Fate model.

COMMENTS PERTAINING TO QEAFATE MODEL

1. The LWG should provide the QEAFATE modeling code to EPA to improve model transparency and facilitate EPA review of the model.

   Response: The LWG agrees to provide the code to EPA for review. We plan on doing so following the completion of the initial calibration (i.e., after January 2010), since there are some small changes that could be made during calibration. We will also need to clean up the comments to improve readability by outside reviewers.

   The list of chemicals to be modeled should be expanded to include 4,4'-DDE. In addition, the strengths and weaknesses of modeling total PCBs rather than individual PCB congeners should be further explored.

   Response: 4,4'-DDE has been added to the list of chemicals to be modeled.
   The LWG is currently evaluating whether to also model total PCBs.

2. A list of calibration parameters should be submitted to EPA prior to completing calibration of the model.

Response: The list requested by EPA was submitted on 12/10/09.

3. Calibrated model runs should be used to validate the assumption that there has not been a significant change in sediment chemistry in the 1997 – 2009 time frame for the purpose of establishing initial conditions.

Response: The LWG agrees – such evaluations will be included as part of the calibration process.

4. The LWG should develop an approach for the development of initial subsurface sediment conditions for EPA concurrence prior to finalizing the calibration procedure.

Response: We are continuing to evaluate approaches, including those discussed with EPA during the 11/18/09 meeting. We will provide EPA with our recommended approach once complete. As noted in the 12/10/09 calibration/sensitivity memo, we are currently running sensitivity analyses to evaluate the extent to which the subsurface initial conditions affect model predictions over the calibration period. If this input is relatively unimportant, we will likely provide the requested information later on in the calibration process.

5. Certain data points from RM 11 were removed from the data set due to potential impacts associated with stormwater discharges. This assumption should be verified.

Response: This was done for the initial model runs. Moving forward, we intend to use an upstream data set consistent with response to Comment 6 below.

6. It is unclear why the geometric mean rather than the arithmetic mean was used to develop contaminant concentration boundary conditions for the presentation. Background concentrations agreed on by EPA should be used at boundary conditions for calibration and future model runs.

Response: We will are revisiting the methods used for upstream boundary conditions, including the relationships between concentration and flow. In cases where no strong relationship is observed, a representative average (calculated separately for high and low flows) will likely be used, as was shown for

the preliminary PCB-126 simulations presented during the 11/18/09 meeting. As for the use of geometric versus arithmetic mean, EPA commented on the AFT model testing report that arithmetic averages should be avoided where underlying parametric statistical assumptions have not been verified. We can agree to using the arithmetic average instead.

Moving forward we agree that background surface water concentrations agreed on by EPA and as presented in the RI should be used for the upstream boundary condition for calibration and future model runs. Specifically, this data set includes combined surface water data from transects at RM 11 and RM 16. Per the RI, analysis of this data set led to the identification of a number of samples as outliers; where these outlier samples likely represent the influence of local sources. These outlier samples were then excluded from the background determination in the RI. A list of these samples can be found in Table 7.4-1 of the RI. The resulting data set with outliers removed will be used for the model calibration and runs. Laura Jones of Integral presented the technical approach for dealing with the upriver surface water datasets to EPA at a 5/29/08 meeting. The RI issue resolution tracking matrix indicates that EPA agreed with that approach at that meeting.

7. Further exploration of the approach for addressing lateral contaminant (in particular, lateral stormwater and groundwater loads) is required. It may be inappropriate to model stormwater over the AFT grid cells. In addition, it is unclear how variations and uncertainties associated with contaminated groundwater flux (concentration and flux rate) will be addressed.

Response: Specification of spatially aggregated stormwater loads was an approach that was previously agreed upon and is consistent with the objectives for the fate and transport modeling effort to inform the Feasibility Study. To provide some bounding on the issue, we will evaluate this issue through a sensitivity analyses, in which loads will be specified at a single point (e.g., at the upstream or downstream end of the segment) rather than distributed over reaches of shoreline to evaluate how this impacts predicted sediment concentrations in near-shore areas.

With regard to groundwater fluxes, sensitivity analyses based on upper and lower bound estimates for these values will be performed to quantify how this input affects model predictions over the calibration period. This approach is included in the list of sensitivity analyses provided to EPA on 12/10/09. We are

also evaluating the groundwater information in general to further understand what spatial variations of groundwater advection rates is most consistent with the overall conceptual site model for groundwater.

8. It is unclear whether speciation modeling will be performed for metal and metalloid contaminants. In addition, it is unclear what chemical, physical and biological processes will be considered in the modeling of mercury.

   Response: Speciation modeling will not be performed for metal and metalloid contaminants, which is consistent with the approach that was previously agreed upon. It was specifically agreed in AFT model discussions that chemical conversions from one species to another would not be addressed through chemical fate modeling and was not necessary to meet the agreed-upon objectives for the modeling.

   The processes that will be simulated for mercury are the same as those used for the other chemicals (i.e., those shown on page 12 of the presentation file from the 11/18/09 meeting), although rate constants will be set based on literature such that certain kinetic processes become unimportant (i.e., biodegradation and volatilization).

9. The issue of how to estimate NPDES discharges (measured concentration of permit limit) remains unresolved. A sensitivity analysis should be performed to understand the relative contribution of NPDES discharges.

   Response: As discussed during the 11/18/09 meeting, we believe it is more appropriate to represent such loadings in the model based on measured concentration data and not permit limits. In addition, as discussed in the 12/10/09 calibration/sensitivity memo, we will conduct sensitivity analyses to quantify the extent to which, if any, these loadings impact the model results. These analyses would consist of comparing results from model runs conducted without NPDES loads with runs conducted with the loads at the full discharge limits (where applicable).

10. Based on the presentation, the current version of the model relied solely on transect data for water column data. Other sampling locations (e.g., source and habitat specific) should be incorporated into the surface water data set for use in the model.

Response: To the extent such samples can be used for meaningful model-data comparisons, the LWG will incorporate as much of the non-transect water column data into the model calibration as possible. We also propose to further evaluate comparisons to sediment trap data as another potential calibration point.

11. Sensitivity analysis will likely show very different results for different classes of chemicals based on their physical and chemical properties. The sensitivity analysis should consider a range of chemical types.

Response: The sensitivity analyses will be conducted for a range of chemical types. While the sensitivity analyses may not be conducted for the full suite of modeled chemicals, we currently envision running for chemicals which represent unique physical characteristics between and within classes of compounds (e.g., PCBs, PAHs [naphthalene and benzo(a)pyrene], DDx, metals).

COMMENTS PERTAINING TO HST MODEL

1. Run model at varying flow events, including high flow events (e.g., 2006 event).

Response: The HST model will be used to evaluate the effects of high-flow events on bed elevation changes (scour and deposition). High-flow events with return periods of 2, 10, and 100 years will be simulated. The potential effects of Columbia River flow on transport processes during high-flow events in the Lower Willamette River will also be examined.

2. Conduct spatial analysis to determine scale at which model performs well. Focus should be on areas of disagreement within the study area, especially in areas identified as Areas of Potential Concern (AOPCs).

Response: A spatial scale analysis, with spatial scales ranging from one grid cell (about 1 acre) to the entire study area (about 1,600 acres), will be conducted to quantitatively evaluate model reliability over a wide range of spatial scales.

It should be noted that EPA is still concerned about how the HST model does not seem to calibrate well in areas of non-cohesive sediments. Further, the bed elevation changes that

occurred in the January 2002 to May 2003 were actual measurement and this may affect model predictions of future events. EPA believes that these two points should be discussed in the uncertainty section of the modeling report.

Response: Reliability of the HST model in various regions of the study area, including non-cohesive bed areas, will be quantitatively evaluated. Additional investigation of the period from January 2002 to May 2003, which is being excluded from the model calibration period because bed elevation changes during this period appear to be anomalous, will be carried out to develop an improved understanding of sediment transport processes in the study area during this time period.

OTHER COMMENTS

Overall, EPA believes that significant progress has been made recently both on the contaminant fate and transport model and the HST model. EPA understands that at this time, initial model set up has been completed and that fully calibrated model will be available in January 2010. However, the steps and time-frame for linking QEAFATE with the HST and Bioaccumulation modeling effort is unclear.

Response: We agree that the fully calibrated model will be available subject to the potential caveats beyond LWG's control presented in the November 18, 2009 presentation. At that time, the QEA Fate model will be fully linked to the calibrated HST model, given that the QEA Fate model cannot be run without the outputs to the HST model. The bioaccumulation modeling effort will proceed after the QEA Fate model calibration is agreed to by EPA using the Dynamic FWM. Because this FWM will have a basic set up and parameter inputs identical to the Steady-State FWM used for PRG calculations, except as informed by the water and sediment concentrations from the QEA Fate model and run in dynamic mode, we do not see a need for any additional check-ins on this aspect of the modeling. This is, of course, subject to any comments that EPA may have on the July 21, 2009, Draft Bioaccumulation Modeling Report, which we would hope to receive in the very near future.